DITCHBURN ORGANISATION

TRAINING PROGRAMME

P200 Service Engineers Manual
Tonomat Panoramic 200

www.Ditchburn.co.uk

ELECTRICAL DATA:

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(1) OPERATING VOLTAGE:

CURRENT CONSUMPTION:

OPEN CIRCUIT	0.85 amps.
OPERATING	1.25 amps.
MOMENTARILY	1.5 amps.

(2) DIMENSIONS:

HEIGHT	153 cm (60¼")
WIDTH	84 cm (33½")
DEPTH	69 cm (27")
WEIGHT	250lbs.(114 kg.)

(3) POWER PACK:

INPUT:	220 volts. A.C.
OUTPUT:	60 volts. D.C.

CONTROL INSTRUMENT: Control Voltage for Relays and Electro-Magnetic Devices: 60 volts. D.C.

Operating voltage for motors 220 volts. A.C.

SOUND SYSTEM:

(a) MODEL P200

AMPLIFIER: 35 Watt Hi-Fi High Efficiency Amplifier.
TELEMATT T-34 with connection for Extension loud-speaker.

LOUD SPEAKER: 5 ohms. 12 W Bass.
5 ohms. 4 W Medium Frequencies.

PICK-UP: Crystal Type, ELAC KST.21.

(b) MODEL P200S

AMPLIFIER: Two-channel 2 x 15 Watt Hi-Fi High Efficiency Amplifier, TELEMATT T-34-S.

LOUD SPEAKERS: 1 Bass Loud Speaker in Cabinet, 5 OHMS 12 W
2 Special Wall Type Loud Speakers, 5 OHMS 7 W.

PICK-UP: Crystal Type ELAC KST.103.

(6) FUSES: POWER PACK 0.5A. DelayFuse.
AMPLIFIER 0.8A. Delay Fuse.

(7) COIN TESTER: NATIONAL rejector with Central Coin Insertion for 3d. 6d. and 1/-d.

(8) LIGHTING:

Mechanical Part and Casing 2 Fluorescent Tubes 220 volts. 13 W.

Programme Lighting 2 bulbs pearl 220 volt. 15 W. Socket E14.

Push-Buttons 1 Lamp, 60W, 0.02A.

Credit Indication 1 Lamp 7 volt. 0.1A.

Title Indication 5 Lense Lamps 3 volt. 0.25A.

II

SETTING UP AND OPERATION.

(1) MAINS CONNECTION:

Before putting the machine in operation, make sure that the mains voltage is the correct 220 VOLTS A.C. 50 CPS. The machine must be connected to an earthed plug. When a voltage other than that mentioned above has to be used, a transformer with a power rating of 300 VA must be connected in series with the mains.

(2) CHOICE OF POSITION:

The position in which the machine is set up should not, if possible, be close to a stove or radiator. Please also see that at no time of the day can the sun shine on the records. The rear of the machine should be a hand's breadth from the wall. In order to check the operation of the coin tester, it is advisable to check the horizontal and vertical positions of the machine.

(3) OPENING THE CASING:

Access to all openings in the casing is centrally through the side-door (164). The key for this will be found outside on the shoulder of the rear wall of the Cabinet (162). When the side door (164) has been opened, the easily accessible coin box cover (175), coin tester (173), and the pull ring (176) for opening the Plastic Front (156) will be seen. The coin box is opened with a separate key which is attached to the coin box cover (175). By pulling on the ring (176), the lock (165) for the Plastic Front (156) is released on the Plastic Front. On the front upper board (136) on the left is a support pin (135) which should be removed and inserted in the peg on the upper board (136) and in the Plastic Front (156). The Plastic Front thus remains open more or less horizontally. The rear Door of the Cabinet (162) can be removed after the two locking Bars (accessible from the front) (161) have been folded back.

(4) ENCLOSURES:

The machine contains the following when delivered:-

Valve Guarantee Card
Amplifier Guarantee Card
Maintenance Instructions for Amplifier -) in pocket on inside wall

2 0.8 amp. Fuses for Amplifier) in pocket on inside wall
2 0.5 amp. Fuses for Power Pack (in pocket on coin-box cover)
One set of Title Pockets)
Ten sheets of Title Paper)
One sheet of Headings)
Two Lens Lamps 3 volt. 0.25A (171))

(5) CHECKING UP ANY DAMAGE IN TRANSIT:

Before putting your P200 into service, we advise you to make a check for any damage in transit. Please notify your Technical Dealer or the Makers, of any defect found. This claim for defects must be received within 14 days of receipt of the instrument, by registered letter. All selector pins (98) which may, under certain circumstances, have been pushed up during transit, must be pushed downwards again by hand.

(6) REMOVAL OF ATTACHMENTS USED DURING TRANSIT:

In order to make the instrument ready to operate, five attachments for securing it during transit must be released:

(a) Knurled nut (51) on the upper suspension of the mechanism (50). Rotate the knurled nut (51) anti-clockwise, as far as it will go.

(b) The block (130)* between the lower suspension for the mechanism (109) and the upper board (136) must be removed, after the two wing-nuts beneath the upper board have been removed and the two screws withdrawn.

(c) The tone arm is secured to the mechanism by an elastic band. The band should be removed and the rubber sleeve pulled off the stop pin (C in sketch).

(d) The protection for the sapphire on the tone-arm is withdrawn in the direction shown by the arrow (D in sketch).

(e) The tone arm weight is secured on the mechanism by a wire clip, this must be removed (E in sketch).

All Packing Pieces should be Retained.

(7) LOADING ON RECORDS:

The records are inserted from the front, (after removal of centres). The title pockets are placed, according to the numbers, in the previously indicated compartments of the revolving programme frame (27) and are distributed into 20 compartments in all with 5 records in each. This distribution allows the combining of individual records into groups. For instance "Latest Novelties", "Hits of the Month", "Marches" etc., as well as their designation by means of the headings supplied.

*130 in the Illustration and List is a ROTATABLE SELECTOR.

In addition, the groups from 50 to 99 are arranged for selective loading with standard or long playing records by inserting an extra 3d. This range is divided into 5 groups of 10 records each, namely 50-59, 60-69, 70-79, 80-89 and 90-99. Switching over the individual groups is effected at the switching strip (34) which is fitted on the contact plate (36) in the lower part of the mechanism, merely by moving over the appropriate contact-springs (35) to the "N" or "LP" position. Take care to see that the swivelling marking of the sapphire is in the right position, namely on "N" for standard records, and "M-stereo" for stereo records.

POPULARITY METER:

The machine is provided with play meters (71) for each separate record. They are mounted directly in front of each record concerned on the circumference of the magazine (78) where they are readily seen. Actuation takes place at every playing by means of the control stirrup (68) and the rockers (69) fitted on the lifters (62). The scales on the popularity meters (71) are numbered from 0 to 30 and show the playing situation of their record at the arrow. So as to be able to see the approximate position of several meters at one glance, the scales are also provided with a coloured spiral so that the mainly black range indicates little playing, and the predominantly yellow range, a great deal.

The return of all meters to zero is effected practically from a central position with one manipulation by pressing on the cancelling button (124) on the rear of the Cabinet which starts the magazine (78) start revolving (see 111,7) and allows the meter pinions (72) to pass in front of a finger until they have all returned to zero. When putting your P200 into service, and every time it is loaded with records, see that all the popularity meters (71) have been returned to zero.

METHOD OF OPERATION

(1) SWITCHING ON THE MACHINE:

Relays Switched In

When the machine is switched on the mechanism will start operating a short while without, however, any record being played. This precaution is taken to guard against trouble due to interruption of the mains' supply so that when the current comes on again the mechanism will start up again automatically in all phases of operation in order to allow any stored playing to be run off.

W WZ

When the machine is switch on, Relay W receives current via contact h^{111}_{1} and is energised, closing the self holding contact W^{11}. Relay Z is switched in via contact W^{111} and capacitor C5 is charged. Relay Z actuates the running of the magazine motor (104) via $N2^{11}$.

WZ

Simultaneously, the forward running of the magazine motor (104) is switch off via W^{1} and the forward running of the record changer motor (42) is switched on via N3; this motor enables the lifter (62) to move inwards through the changer drive (52) and the chain (54) and by means of the camshaft (53), controls the cam switches N1 to N6 in sequential order; $N2^{11}$ opens, $N2^{1}$ closes and prepared the return running of the record changer motor (42). $N5^{11}$ closes and energises the centring magnet (66). $N1^{1}$ closes and effects energises relay H; $N1^{11}$ closes and relay W drops out through a short circuit via contact h^{11}. As a result, relay H pulls on via contact W^{11} and hold on via self-holding contact, $h^{11}2$ until the mains current is interrupted.

Z

HZ

$h^{111}1$ and h^{11} are thus kept open permanently and the procedure cannot be repeated.

When ready W drops out the forward running of the record changer motor (42) is interrupted via W^{1} and its backward running switched on via the previous prepared N2. The lifters (62) are drawn downwards and the camshaft (53) turns backwards.
$N1^{11}$and $N1^{1}$open.

N4 opens and switches the centring magnet (66) off; $N2^{1}$opens and interrupts the changer-motors reverse running; $N2^{11}$closes and switches the magazine motor (104) on. As a result, the lifters (62) have again returned to the initial position; the magazine (78) rotates and makes $1\frac{3}{4}$ to 2 revolutions until, at the end of this time, C5 is largely discharged through R6 so that relay Z finally drops out and switches off the magazine motor (104). The entire mechanism thus comes to rest. All that is energised is relay H, the muting relay in the amplifier (140) and the relay (113) on the contact plate (36).

H

2) CO. INSERTION AND CREDITING:

The instrument has a NATIONAL coin-tester for 3d. 6d. and 1/-d. The credit allowed in a series is set to:

2 x 3d..... 1 playing.
1 x 6d ..... 1 playing.
1 x 1/-d ..... 3 playings.
1 x 3d..... extra coin insertion of L.P. records.

Setting for other credit allowances is described in Section IV.

(a) Credit Allowance with 2d. x 3d.

H The first insertion prepares the credit allowance. The coin actuates the

H E(D) Z coin switch MK 10/20 (149) Capacitor C^1 discharges via MK 10/20 and relay E. As a result of the impulse, relay E pulls on, holds itself on via contact e^{11} and switches the rotating selector D (130) in by means of contact e^{11}. This closes contact s^{11} of the rotatable selector (130)., capacitor C^5 is charged, relay Z pulls on and holds on through the discharge of C^5. The magazine motor (104) is switched on via contact z so that the magazine (78) already revolves after insertion of the first coin.

Simultaneously, with the first step of the rotatable selector, (130) capacitor C^1 is again charged via contact 1 of the d-track and relay B.

H(B)Z As a result of the impulse relay B pulls on and again switches off the relay E and the rotatable selector D (130) with its contact b^{111} so that the sliders a, b, c, d of the rotatable selector (130) remain stationary on the first step.

HZ In this phase there is as yet no credit because the current supply to the selector-magnets "A" (100) and "B" (95) is still interrupted at the track a and contact $b^{11\ 2}$. when the second coin is inserted, however, MK 10/20 (149) closes

HZED and discharges capacitor C^1 via relay E which pulls on and again switches in the rotatable selector D (130). Relay E holds on via contact e^{11} and pulses the rotatable selector (130), controlled by the automatic Self interrupting switch, until, at the last step, capacitor C^1 again charges via contact "IV" of the "d" track and relay B. Relay B pulls on again as a result of the impulse, switches off relay E and rotatable selector D (130) as before with contact $b^{11\ 1}$ but now holds on via its contact $b^{11\ 2}$, e^{111}, D, b^{111} and the "a" track of the rotating selector (130). Since the rotating selector (130) has now stopped one step before the initial position, there remains one step for the whole cycle and therefore credit for one playing. The circuit for the selector -magnets (95 and 100) is ready, as far as the push-buttons (153) via the "a" track, b^{111}, D, e^{111}, $b^{11\ 2}$, s^1. This preparation of the circuit is indicated by push-button lamp (153) which draws its current via the same path though in parallel with the push-button (153) and further via the slip-ring (32), the selector-magnet B (95) and the outer wiper (30) of the contact-plate (36) to the chassis-earth (x). Through the opening of contact $b^{11\ 1}$ when relay B drops out, relay (113) on the contact-plate (36) is switched off and switches on, with its rest-contact, the credit indication "Selection" (159) at the coin insertion slot (160) as well as the title indication with the lens lamps L1 to L5 (171). The lamps L1 to L5 (171) are kept permanently pre-heated via 5 series resistors (108) on the contact-plate (36) during the whole time the credit is available and light up in sequence during the forward movement of the inner slider (31) on the contact-plate (36).

3) SELECTION AND STORAGE:

HZB Looking through the programme by turning the hand-wheel (166) simultaneously brings in the record desired. The record brought in is always the title as shown by light-spot. The selection of titles A or B is effected by depressing the appropriate push-button (153). This takes current to selector magnet A (100) or B (95) through the circuit (prepared as explained in 2) and the outer slider (30) of the contact-plate (36) to the chassis-earth (x) and pushes up the corresponding selector-pin (98). Simultaneously the rotatable selector (130) moves on and moves one step further towards the terminal position. This selects a record and cancels a credit. Since, however, s^1 opens as the selector (130) moves on, the L.P. relay is momentarily switched in to amplify the impulse, the capacitor C7 being charged via the second winding of the L.P. relay when the push-button (153) is depressed. Current is then supplied to the selector-magnets (95) or (100) during this short period via contact LP^{111}. After selection has taken place C7 discharges again via the rest-contact of the push-buttons (153) and the resistor R15. The selector-magnet (95) or (100) remains in all cases during the selection switched in through its self-holding contact on the armature as long as the push-button (153) is depressed. This prevents more than one impulse being given to the rotatable selector (130) through unsteadiness of the sliding contact (30) and too much credit being cancelled. The programme-frame (27) is stopped during this time by the selector push-rod (94) or (102). In this way all the 200 titles in the machanism can be stored for playing. After all the credits have been selected, the wipers of the rotating selector (130) are once more in the initial position. The circuit for the selector-magnets (95 and 100) is now again interrupted on the a-track so that the relay B is also switched off and switches in relay (113) on the contact-plate (36) with its contact $b^{11}1$. The credit indication (159), title indication (171) and push-button lamp (155) go out.

4) SELECTION OF A LONG-PLAYING RECORD.

HZB If a long-playing record has been brought in without a further 3d. having been inserted, the push-button lamp (155) and L.P.-Lamp (154) (long-playing record-insert 3d. extra) light up weakly. On depressing push-button (153) the selector magnet does not respond at first and the L.P. lamp (154) lights up brightly. Cause; The selector-magnets (95 and 100) have no direct chassis-earth connection on the contact-plate (36) but the L.P. lamp (154) is still connected in series via the switching strip (34) and contact lp^1. Depressing the push button (153) short-circuits the push-button lamp (155) and the L.P. lamp (154) receives the full voltage. When a further 3d. is

HZB LP inserted the L.P. relay receives an impulse via MK 10/20, contact b^1 and b-track on the rotating selector (130) through the discharge of capacitor C1 so that it pulls on and then holds itself on via the automatic holding contact $lp^{11\ 1}$. The selector magnets (95 and 100) now have a direct chassis-earth connection via the contact-plate (36) and contact lp^1, the L.P. lamp (154) goes out and choice can be effected as explained in 3).

During selection, as a result of the advance of the rotating selector (130),

HZB contact $s^{11\ 3}$ is temporarily closed which short-circuits the L.P. relay and again lets it drop out. After this the playing of a new L.P. record can only be effected by again inserting 3d.

5) LIFTING AND PLAYING A RECORD.

HZ The magazine motor (104) is switched on by the Z relay and drives the magazine (78). After selection has been completed, the magazine (78) moves with its stop MSK (82) up against a pushed-up selector-pin (98). The relay W is connected to

HZW the chassis via MSK (82), pulls on and closes the self-holding contact W^{11}. Contact W^{111} closes and holds relay Z; the playing-motor (83) and the forward rotation of the record-changing motor (42) are switched on and the magazine motor (104) switched off. The playing-motor (23) drives the turntable (64) by means of the friction-wheel (22) while the record-changing motor (42) drives the gearing (52). The lifters (62) are freed and move under the pull of the lifter springs (63) in such a way that one lifter (62) lifts out the selected record between two magazine (78) stirrups (70) while the opposite one moves in front of a stirrup (70) and thus stops the magazine (78) in its position. Choice of either side (A or B) of the selected record is made by the record being lifted out by either the right or left-hand lifter (62).

Simultaneously, the camshaft (53) revolves and actuates the cam-switches N1 to N6 (3) in the following phases:

a) $N2^{11}$ opens and disconnects the supply to the magazine motor (104)
$N2^{1}$ closes and prepares the reverse running of the record-changing motor (42)

b) $N5^{1}$ opens.
$N5^{11}$ closes and energises the centring magnet (66). The record moves via the tipper (74) in front of the turntable (64).

c) N6 closes and prepares the switching on of the cancelling magnet (80).

d) $N5^{11}$ opens and switches the centring magnet (66) off. The record is taken by spring pressure from the centring cone (65) and moved to the playing position on the turntable (64).
$N5^{1}$ closes and energises on the cancelling magnet (80) which cancels the selector-pin (98) into the initial position.

e) N6 opens and switches the cancelling magnet (80) off.

f) The control disc (12) frees the tone-arm (92) and the latter is lowered on to the record.

g) N3 switches off the forward running of the record-changing motor (42).
N4 opens and the muting relay in the amplifier (140) drops out (slightly delayed) and switches on the anode current (sound).

6) RETURN AND CHANGING THE RECORDS:

As soon as the record has been played and the tone-arm (92) runs into the end-groove, the contact TK (17) which is operated by the tone-arm closes. The relay W is thus short-circuited and drops out. Contact w^{111} opens and relay Z holds on for a time through the discharge of capacitor C5. W^{1} switches the record-playing motor (23) off, and switches on the return running of the record-changing motor (42) via the already prepared $N2^{1}$. The lifters (62) are again brought back to their initial position and the record is returned to the magazine (78) by means of the changer-drive (52). Simultaneously, the camshaft (53) revolves backwards and thus actuates the cam-switches (3) in the reverse order to that given in 5) namely:

a) N4 closes and energises the muting relay on (sound off).
N3 closes and prepares the record changing motor (42). for forward running.

b) The control-disc (12) raises the tone-arm (92) from the record by means of the control-rail (14) and pressure-pin (15). The tone-arm moves back to its initial position under the influence of the counter-weight.(18).

c) N6 closes and energises the cancelling magnet (80)

d) $N5^{1}$ opens and switches the cancelling magnet (80) off. $N5^{11}$ closes and energises the centring magnet (66), the record leaves the turntable (64).

e) N6 opens and prevents the cancelling magnet being energised again by $N5^{1}$.

f) $N5^{11}$ opens and switches the centring magnet (66) off.
$N5^{1}$ closes.

g) $N2^{1}$ opens and switches off the return running of the record-changing motor (2).
$N2^{11}$ closes and switches the magazine motor (104) on.

The changer-drive (52) is at rest, the record has been returned and the lifters (62) are again in the initial position. The brake (45) on the record-changing motor (42) prevents automatic forward rotation of the changer-drive (52). The cam-switch N1 is out of operation while a record is being changed (see in Section 111 "Switching on the machine".) With the switching on of the magazine motor (104), the magazine (78) begins to revolve. If still further selections are stored (that is, selector-pins (98) lifted up), the magazine (78) with MSK (82) again moves up against a selector-pin (98) and the procedure is repeated as explained in 111, 5) to 6).

If no more selections are stored, the magazine (78) continues to turn until, after $1\frac{3}{4}$ to 2 revolutions, capacitor C5 has discharged to such an extent that

H relay Z drops out and switches off the magazine motor (104).

6) Cont:

With the exception of relay H, the muting relay in the amplifier and the relay (113) on the contact-plate (36), all the relays have dropped out and all motors, tell-tale and indication lamps are switched off.

7) INTERRUPTION OF PLAYING - STARTING THE MAGAZINE

The playing of a record can be interrupted by operating the push-button switch (124) on the rear of the cabinet. The switch (124) then closes (like the tone-arm switching-off contact (17) in 111 6), shorting out the W relay. This relay drops out and the record is taken back as described in 111, 6). In the same way, depressing the push-button switch (124) starts the magazine (78) revolving with the mechanism stationary. The capacitor C5 is charged via the push-button switch (124) and relay Z energised. The Z relay switches the magazine motor (104) on, and is held on again through the discharge of the capacitor as described in 111, 6).

IV. ALTERING THE CREDIT ALLOWANCE:

The credit particulars given below are possible by connecting the appropriate contacts on the rotating selector (130):
With the credit allowance as shown at D care must be taken to see that the tracks a and b have an additional jumper from contact 3 to contact 2.
(See sketch D).

A) 2 x 3d..... 1 playing
1 x 6d..... 3 playings
1 x 1/-d..... 6 playings

B) 2 x 3d..... 1 playing
1 x 6d..... 3 playings
1 x 1/-d..... 7 playings

C) 2 x 3d..... 1 playing
1 x 6d..... 4 playings
1 x 1/-d..... 8 playings

D) 1 x 3d..... 1 playing
1 x 6d..... 5 playings
1 x 1/-d.....10 playings

V. REMOTE VOLUME CONTROL.

The remote volume control (134) is fixed on the rear of the cabinet. It is possible to fit the volume control in a convenient position for operating, inside or outside the room where the instrument is installed.

1) MODEL P200 STANDARD:

The built-in remote control can be used by merely extending its two-wire connecting cable to the amplifier (140). It does not matter to which pole the two conductors are connected. Otherwise a 25 k ohms potentiometer having a logarithmic characteristic curve must be used. Connection to the amplifier can be made with two wander plugs.

2) MODEL P200 STEREO:

Both channels are controlled separately via two mechanically-coupled 10-step switches. If required the built-in control can be used remotely. Otherwise, a complete remote control is required. The connection is made with a three-core cable and special plug, type MAS 3. Make perfectly sure that the common conductor to the two step-switches is connected to the centre pin of the plug. The two other conductors are interchangeable. The built-in control can be used as a specimen layout.

VI CONNECTING ADDITIONAL LOUD-SPEAKERS:-

1) Model P200 Standard

The instrument is suitable for the connection of additional loud-speakers which are connected to the terminals (141) of the amplifier (140) previously mentioned. The additional loud-speakers can be connected with wander plugs to the sockets (126) on the rear of the cabinet. The leads to the sockets (126) have already been fixed in the cabinet, the loud-speaker terminals (141) on the amplifier (140) merely need to be connected up. A5 ohm speech-coil is necessary for matching. The overall output of the loud-speakers must not exceed the power rating of the amplifier which is 20 W

2) Model P200 Stereo.

The P200 S is already provided with two special wall-mounting loud-speakers. Connection is to the red or yellow sockets on the rear of the cabinet namely:

RED	Channel 1
YELLOW	Channel 2

The best stereophonic sound effect is obtained when the two loud-speakers are opposite each other, on each side of the instrument, AND the same distance from it a separate bass and treble is controlled, and is fitted in the amplifier for each channel.

VII. CHANGING OVER THE STANDARD INSTRUMENT TO STEREO OPERATION.

Should it ever be necessary to change over to stereo records, the necessary equipment can be fitted to your P.200 without difficulty. Since the model P200 is previously prepared, as standard, for subsequent stereo operation, this modification can be carried out with the minimum of work and expense. On request a complete unit with instructions for fitting can be supplied.

VIII. CARE AND MAINTENANCE.

We advise you to make an inspection of the machine every 4 to 6 weeks. Maintenance is then restricted to the few points mentioned below:

1) Cleaning. Contact-plate (36)
Tone-arm switch contact (17)
Turntable (64)
Coin-mechanism (173)

Suitable cleaners are carbon tetrachloride and trichlorethylene.

2) Oiling. Eyes on lifting-rod (58)
Lifter spindle (16)

3) Greasing. Push-rod (83) on cancelling magnet (80).
Once annually, the bearing for hand-wheel (165).

We should like to emphasise here that the use of oil and grease is only permissible for these few points. All other parts have sintered bushes which require no attention and need no additional lubrication.

All work on the mechanism can be carried out from the front without removing the rear door. It is merely necessary to withdraw the pin (118) which passes through the centre shaft of the mechanism from the lower mechanism suspension point and to release the securing screw (119), the entire mechanism can now be swung (even while a record is being played) 180° round its vertical axis in the housing. In this way, there is always convenient and easy access to the mechanism at all times

4) It is adviseable to change the sapphire stylus after every 2000 to 2500 playings.

IMPORTANT POINTS:

Please observe the following important directions:

1) Replacing electric lamps:

When replacing lamps always make sure that the faulty lamp is exchanged for one having the same electrical characteristics. This is particularly the case for the lamps below:

"Select"	7 V 0.1 A (159)
"Long-playing record, insert extra 3d."	60 V 0.2 A (154)

Push-buttons A - B 60 V 0.2 A (155).

Title indication 3 V 0.25A Lens-lamp (171)

The data is, in addition, shown once again at the appropriate places in the machine. Using the wrong lamps may cause trouble!

2) Actuating the coin switch (148)-(150):

The coin switches are covered and fitted in such a way that they cannot be operated directly by hand, do not try to depress them with some small object since simultaneous operation of two switches may lead to damage of micro switches.

ADJUSTMENT INSTRUCTIONS:

Raising and discharging the records.

1) Adjusting the selector-drum (97).

Rotate the magazine (78) until record 00A on the right hand side of the mechanism (seen from behind) is parallel with the head-plates (61) and (93). Push selector pin 00A (81) up (third pin in the inner row on the right near the overlap of the drum segments). Loosen the securing screw (99) in the drum boss; rotate the drum (97) until pin 00A (81) touches the stop MSK (82) on the contact side. Lock the drum (97) in this position with the securing screw.

2) Setting the lifter (62) to the record:

a) In the playing position, the record should revolve in the centre of the lifting fork. Adjust by aligning (bending) the lifter (62).

b) The inner fork-end of the lifter (62) should be 2 mm away from the circumference of the record while the latter is playing.

Adjustment is by the adjusting screw (59) on the lifting lever (60)

3) Setting the lifter (62) to the record-bows (70)

When entering, the fork-end of the lifter (62) should be at an equal distance from the two neighbouring record-bows (70). Adjust by aligning the lifter (62) (then check adjustment 2a once again) or by correcting adjustment 1.

4) Adjustment of lifter (62) to the popularity meters (71):

Tilt the actuating pin (73) of the pop-meter (71) inwards; when the lifter (62) enters, the distance between the lifters (62) (measured at the inner fork-end) and the actuating pin (73) should be 2.5 mm.
Adjust by aligning lifter (62).

After this, check adjustment 2b.

5) Setting lifter (62) in rest position:

Set so that 5° before the drive (32) has ended its run-out (reading on graduated plate 1), the tips of the lifters (62) are vertically above the circumference of the magazine (78).
Adjust the record lift arm adjuster (56) for the chain (54).

6) Operating lever-Popularity Meters (68).

Adjust so that, as with the lifters (62) in adjustment 3, when they enter they are at an equal distance from the record-bows (70).
Adjust by releasing the securing screws (67).

The rockers (69) should pass 1 mm above the edge of the magazine when the latter revolves. The free end of the operating lever (68) must pass 2 mm over the actuating pins (73).

Adjust by bending

7) Setting the Tipper (74):

In the playing position, spacing between tipper (74) and record circumference:- 2mm. Adjust by rotating the eccentric screw (75).

8) Aligning the sheet-metal record guides (77):

Align them so that when MSK (82) comes up against a selector-pin (98) the bottom end of one guide (77) is directed, for taking the record, in the centre between the two record-bows (70). Check both sides of magazine. Height of the ends approx. 5mm above the rim of magazine (78). Adjust by bending.

9) Centring cone (65)

Adjust for concentric running with the turntable (64). Adjustment is made with the turntable revolving, the core (86) being adjusted and aligned after the securing screw (76) has been released so that the spindle of the centring cone (65) has the same clearance on all sides in the centring magnet (66) when revolving.

Adjusting the drive and control components.

10) Setting the graduated plate.(1)

Rotate the graduated plate (1) on the cam spindle (53) and screw up tight so that the pointer (2) is on "0" with the mechanism in the playing position.

11) Switch movement of cam switch (3)

The full height of the cam lift should be used for the switch movement. Adjustment: The complete cam-switch unit (3) is adjusted in its holder on the rear hand-plate (61) so that the rollers (6) lie without pressure on the inner tracks of the cams (4). Adjust roller lever, by bending.

12) Setting the contact cams (4)

The switching sequence of the contact cams (4) is set according to the degrees on the graduated plate (1). After setting is completed, the threaded screws (5) in the cams (4), two each, should be screwed up tight. The indication "open" or "close" relates to the rotation of the graduated plate (1) in the direction from 270° to 0°:

Regarding N2:

The contact-blades must be adjusted to "Operate" so that $N2^{1}$ closes before $N2^{11}$ opens. The indication of 240° is only approximate. Accurate adjustment is dependent on the rest-position of the lifter (62). With the mechanism switched on in the rest-position, the lifters (62) are held in this position by the brake (46) on the record changing motor (42). If the brake (46) is released, the lifter spring (63) pulls the lifters (62) in the direction of the playing position and simultaneously sets the drive (52), and with it the cam spindle (53), in motion.

However, as soon as N2 closes the backward running of the record-changing motor (42) is switched on and returns the lifters (62) back to the rest position again. N2 thus opens again immediately, the lifters (62) move forward afresh and the procedure is repeated continuously as long as the brake (46) is released. The lifters (62) swing to and fro constantly for a short distance. The setting of N2 must now be carried out so that the lifters (62) do not approach the record-bows (70) nearer than 5mm while they are swinging.

13) Setting the chain guide:

Make the alignment so that the chains (54) run in the centre of U-shaped guides set the guides (55) inwards so that the adjusters (56) do not lie on the guides (55) when the chain (54) is relieved of tension and can drop down.

14) Record-changing motor (42) - Return-motion brake (46):

Adjust the initial tensioning of the tension spring (45) on the felt brake (46) so that the record changing motor (42) when in the stationary position is just prevented from running backwards. Adjust by lowering the suspension-eye (44).

Adjusting the turntable drive:

15) Friction drive:

Adjust the axial play in spindle (21) so that there is slight movement. Adjustment by axial displacement of the inner adjusting collar (40). Tension of tension spring (20) approx. 90 grams. this is adjustable by rotating the outer adjusting collar (41) on the spindle (21).

16) Record-playing motor (23):

Align the suspension so that the motor spindle is parallel with the axis of the turntable (64).

17) Adjusting contact-plate (36):

a) Coarse adjustment: Adjust selector magnet (100) on pin 00A. Slacken securing screw (120) in the boss of the contact-plate (36) and rotate the latter until the wiper contacts (30 and 31) are on the first connected-up pair of rivets (106). (First contact as seen counter-clockwise from above).

b) Fine adjustment: Adjust the contact-plate (36) so that when the selector magnets (100) revolve to the left and right there is a contact at the same distance from the selector pin (81).

18) Contact-slider adjustment:

Set the spring hook (121) so that the contact-wiper (28) moves without lateral pressure over the contact track (37 and 38). Adjust the applied pressure so that the spring hook (121) in the untensioned state (contact wiper (28) removed) just touches the bottom of the contact-track. Adjust by bending or by screwing the threaded rod (122).

19) Contact pins (30 and 31):

Amount of lift when searching the contact-rivets (37 and 38), 0.15 to 0.2mm. Adjust tapped collar (29). Applied pressure about 15 g.

20) Voltage on lens lamps (171):

Adjust the series (wiper) resistance (111) on the contact-plate (36) so that with a mains voltage of 220 V there is a voltage drop of 2.9 V at the lens lamps (171).

Adjustments on magazine (78):

21). Magazine drive:

The pressure applied by the magazine motor (104) must be sufficient for it to be able to drive the fully laden magazine without slip. If necessary, shorten tension spring (103) or replace.

22) Back Stop Brake (39)

Align the braking surface so that it is parallel with the circumference of the magazine.

Adjustment of cancelling (80) and selector magnets (95 and 100):

23) Cancelling magnet (80). Operating position:

The push-rod (83) must be 1 mm. below the under edge of the magazine stop (82) with the magnet energised. Adjust by adjusting-screw (84) in the sheet metal cover (85) of the magnet.

24) Cancelling magnet (80). Rest position:

Clearance between adjusting screw (84) and push-rod (83) approx. 0.5mm. Adjust at the magnet armature by releasing the clamping-screw (79) and the sheet-metal cover (85) and then raising or lowering the armature until the correct clearance is obtained. Secure clamping screw (79).

25) Selector magnets (95 and 100). Operating position:

Align push-rods (94 and 102) so that their operating surfaces are parallel with the selector plate segment (96) and projects 8 to 9 mm. above the segment (96) with the magnets energised.

26) Selector magnets (95 and 100). Rest position:

Release the clamping-screw (101) on the armature and adjust push-rod (94 and 102) so that it clears the upper surface of the selector-plate segment (96) secure clamping screw (101). Spring tension approx. 40 grams. measured at the front end of the push-rod. From design 21170 onwards: clearance between contact spring and armature 1 mm. Adjust by bending the contact spring.

Tone-arm adjustment:

27) Positioning of points: Adjust the points (89) so that the tone-arm carrier in the fork (88) has slight play.

28) Axial clearance:

The position of the tone-arm fork (88) should be set so that there is an axial clearance of 0.2 to 0.3 mm. Adjust by axial displacement of the balancing lever (19).

29) Balance:

The counter-weight (18) must be screwed to a position such that the tone-arm (92) moves slowly back from the end-position to the rest-point due to the small over-balance weight.

30) Dip:

The dip of the tone-arm (92) is adjusted by means of the screw (90) in the latter. It should be adjusted in the playing position, with no record, so that the sapphire is some 6 mm from the surface of the turntable (64).

31) Lowering point:

The sapphire should lower into the turntable some three revolutions before the start of the sound. Adjust the balancing lever (19) on its axis. When this has been done, check adjustment (28).

32) Switching-off point:

Adjust so that the contacts of the switching-off contact (17) for the tone-arm touch at the point where the stylus starts to run out. Adjust by bending the contact springs; align contact rivets in relation to each other.

33) Application pressure:

The sapphire should be applied with a pressure of 8 to 10 gns. measured with the record revolving. Correction by extending, shortening or replacing the tension-spring (91).

34) Stop Pin (47):

After adjustment 32 the distance between the tone-arm (92) and the stop pin (47) should be 0.5 mm. Adjust by moving the stop pin (47) after the securing screw in the front head-plate (93) has been released.

Adjusting the sapphire brush (48):

35) Distance from turntable (64):

The back of the brush (48), in the rest-position, should be 3 to 4 mm from the turntable (64) surface. Adjust by lining up the arm (49) carrying the brush.

36) Distance from record:

In the playing position there must be 10 to 12 mm clearances in an upward direction, from the edge of the record. Adjust by rotating the inner setting-collar (8) on the arm (49) carrying the brush.

37) Distance from sapphire:

In the position, the brush (48) should extend 5 mm over the sapphire after the latter has passed. Adjust by rotating the outer setting-collar (7) on the arm (49). carrying the brush.

38) Pre-tensioning the restoring spring (9):

The torsion spring (9) on the arm carrying the brush (49) requires 5 revolutions to tension it. Re-adjust by winding or unwinding.

Adjustment in the cabinet:

39) Title indication:

Switch on credit. After lossening the securing springs, arrange the lamp-holder (170) so that the bright spots from the lens-lamps (171) fall on the centre of the title selected.

40) Programme drive:

Loosen screwed joint on bushing. Screw the bushing upwards or downwards so that the segments (27) of the programme-frame touch the friction-covering on the driving-wheel (168) in the centre. Then pull the drive unit forward in the casing so that the frame is rotated without slip when being driven. Finally screw up bushings tightly.

41) Drum covering (172):

Release securing screws in clamp (123). Arrange the covering (172) so that the magazine (78) turns freely. Secure covering (172) in this position.

DIAGNOSING THE SOURCES OF TROUBLE:

Trouble	Possible cause.	Remedy
When switching on:		
One record is withdrawn and played continuously.	$N1^{l}$ and $N1^{ll}$ do not close; dirty or bent	Clean contacts or straighten.
	Contact-cam 1 (4) loose.	Adjustment 12
	MSK (82) has permanent connection to earth	Check stop (82) wiper contact (24)and lead for shorts
One record is withdrawn to the playing position then returned to the magazine (without being played).	$N1^{l}$(3) or h^{ll} does not close; dirty or bent	Clean contacts or straighten
Lifters rock at half-height	$N1^{l}$ (3) or w^{ll} rest-contact do not close; dirty or bent	Clean contacts or straighten

Lifters (62) rock from rest-position as far as magazine edge (78)	Brake (45) on changer motor (42) too loose	Adjustment 14
	Brake (45) on Changer motor (42) slipped off	Replace
	Brake-band (45) wrongly placed	Turn so that the tension spring (44) is on top
Mechanism starts up slowly and then stops; fuse (144) in power pack blown	Short between wipe contacts of MSK and centring magnets (24 and 25)	Straighten wipe contacts (24 and 25); replace fuse (144)
Changer drive (52) does not start, magazine rotates continuously Credit indication (159) and title indication (171) continuously lit up	Push-button switch (124) on rear of cabinet defective	Replace
	Contact of relay (113) on contact-plate bent; always closed	Adjust
	Relay (113) or lead defective	Replace or check lead

Trouble	Possible cause.	Remedy
<u>After insertion of coin</u>:		
Coins continually rejected.	Instrument is not level	Level it horizontally
	Coin-tester (173) hangs loose or is crooked	Straighten and secure
No credit after insertion of coin	Coin tester (173) dirty	Clean
	Coin hangs on micro-switches (148) to (150)	Remove coins.
	Micro-switches (148) to (150) defective.	Replace

	Wire loop on micro-switch bent or stuck	Straighten
	Connections on micro-switches (148) to (150)	Check terminals
There is credit but the credit indicator does not light up	Bulb (159) loose or burnt out	Tighten or replace.
Credit indication (159) and title indication (171) do not light up	Plug (116) not in amplifier	Insert
	Relay contact (113) open	Adjust
	Relay contact (113) dirty	Clean
All title indications do not light up, no pre-heating of lense lamps (171), credit indication (159) burning	No current through wiper resistance (111) due to dirty contact surfaces or wiper loose	Clean contact surface; secure wiper: check adjustment 20
	Winding of wiper resistance (111) loose at end	Solder or replace; check adjustment 20
Trouble:	Possible cause:	Remedy:
Two or more lens lamps (171) alight at same time	short circuit between two switch-bridges (107) on the inner contact-plate track (38)	Bend apart; if necessary, insulate
Sequence of lens lamps (171) upset	Connections to terminal block (163) in-correct	Connect up in and out leads of same colours.
One or more lens lamps (171) go out when programme frame revolves.	Bulb (171) loose	Tighten up and secure with varnish
	Bulb (171) burnt out	Replace and check.

		adjustment 20
	No preheating because resistor concerned (108) on contact-plate (36) is loose or defective	Solder or replace
	Contact-pin (31) dirty or stuck	Clean and check adjustment 19
	Insufficient pressure applied to contact pin (31)	Adjustment 19
Light-spots do not fall on centre of title	Lamp socket (170) Not in correct position	Adjustment 39
Programme frame (27) will not revolve	Drive jams in casing or at lamp socket (170)	Adjustment 40
	Frame (27) sticks on lens lamps (171)	Bend lamp socket (170) back; Check adjustment 39
	Driving wheel (168) slips or is not in contact	Adjustment 40
	Selector magnet (95) or (100) jams in working position	Adjustment 25/26
	Selector magnet B (95) after first choice permanently energised, wrong bulb (155) in push-button.	Insert bulb (155) specified

Trouble During selection:	Possible Cause:	Remedy:
Credit is shown but push-buttons (153) do not light and selector magnets (95 and 100) do not close	Earth connection of outer contact-plate track (37) interrupted	Re-solder
	Contact wiper (28) not firmly applied	Adjustment 18
	MK 100 or MK 50 (150) jams in working position	Free mechanical jamming; replace if necessary
Selector magnets (95 and 100) do not close in one or more LP-groups; push-button. (153) does not light up	Contact springs (35) on switching strip (34) loose or dirty	Clean and secure
Selector magnets A (100) and B (95) close simultaneously	Wiper contacts (30 and 31) of magnets touching each other	Separate and straighten
Selector magnets (95 and 100) wrong selection	Contact-plate (36) loose and displaced	Adjustment 17
Selector pin (98) is not pushed up high enough	Magnet push-rod (94) or (102) displaced	Adjustment 25
	Selector rod (98) stuck	Free it and grease if necessary
Trouble:		
Continuing credit after insertion of single coin	Wrong bulb in push-button lighting(155)	Replace by bulb (155) 60 V 0.02A
Push-button (153) continuously alight for credit; magnets (95) or (100) close in all positions.	Self-holding contacts on armature of magnet (95) or (100) permanently closed	Adjustment 26

Selection of LP record possible without insertion of extra 3d	Section concerned not switched over to "LP"	Switch over
	Contact rivet group concerned has direct earth connection	Check wiring of contact-plate (36) and switching strip (34)
Troubles after selection:		
Record-magazine (78) does not revolve	Drum-covering (172) sticks on magazine (78)	Adjustment 41
	Magazine motor (104) insufficient pressure.	Adjustment 21
	Magazine motor (104) will not run	Check N2 adjustment 12
	record bow (70) cling to lifters (62)	Adjustments 5, 12 and 14
Record-changing drive (52) will not operate	Tone-arm switching-off contact (17) bent; permanently closed	Adjustment 32
	Tone-arm (92) stuck in switched-off position	Release and check adjustment 28 and 29
	MSK (82) fails to make contact	Check lead from MSK (82) on plug-pin B1
Trouble:	**Possible cause:**	**Remedy:**
	Tension-chain (54) stuck in pinions	Rotate drive to rest position Adjustment 13

Lifter (62) remains hanging on record bows (70)	Cancelling magnet (80) stuck in operating position	Free sticking; check adjustments 23 and 24
	Cancelling magnet (80) permanently energised	Check adjustment 12
	Selector drum (97) displaced	Adjustment 1
	Lifter (62) bent	Adjustment 3
Popularity meter (71) is not actuated	Playing meter (71) defective	Replace
	Control stirrup (68) loose or bent	Adjustment 6
Centring magnet (66) does not pull on	N5 (3) fails to operate	Adjustment 12
	Coil (66) defective	Replace
Record is not centred on turn-table (64)	Centring magnet (66) opens too late or drops out too soon	Adjustment 12
	Tipper (74) or lifter (62) setting incorrect	Adjustment 7 or 2
	Stop-pin (87) loose	Screw up tight
Record sticks when being lifted	Sheet-metal record guide (77) bent	Adjustment 8
Turntable (64) does not revolve	Playing motor (23) not revolving	Check terminal connections on motor (23)
	Friction drive greasy	Wash friction-wheel (22) and turntable rim (64)
	Friction wheel (22) not in contact	
	Pressure of friction wheel (22) too slight or no axial play in rocking shaft (21)	Check adjustment 15

	Friction wheel (22) is jammed on spindle	Remove; clean and grease bearing and replace if necessary.
Tone-arm (92) lowered onto record too far in	Balancing lever (19) displaced	Adjustment 31
	Tone-arm (92) did not return fully to rest position;	Adjustment 28
Tone-arm (92) jumps over record when lowered	Drive clutch (57) on record-changing motor (42) jammed or tight on shaft	Dismantle, clean and grease lightly if necessary
Tone-arm (92) does not lower onto record	Control-plate 12 displaced	Adjustment 12
	Pressure-pin (15) jammed	Loosen and grease lightly if necessary
	Point (89) positioning to tight.	Adjustment 27
<u>Trouble when playing</u>		
Tone-arm (92) jumps over the record	counter-weight (18) wrongly positioned	Adjustment 29
	tone-arm pressure too low.	Adjustment 33
<u>Trouble:</u>		
Record-changing motor (42) is not switched off	Contact-cams 3 (3) displaced	Adjustment 12
Noises in loud-speaker when ton-arm (92) is lowered	N4 (3) switches too soon	Adjustment 12
Sound starts up too late	N4 (3) switches too late	Adjustment 12
Rumble or scratching while playing	Record in contact with lifter (62)	Adjustment 2
	Record in contact with tipper (74)	Adjustment 7
	Record in contact with brush (48)	Adjustment 36

	Centring cone (65) does not run concentric with turntable (64); spindle in contact with centring magnet (66) casing.	Adjustment 9
	Centring cone spindle revolves jerkily	Dismantle, clean bearing and grease.
	Thick local dirt deposit on rim of record; friction-wheel (22) jumps.	Clean rim of record
	Friction wheel (22) circumference damaged;	Replace
Sound fluctuates:	Record much warped	Replace
	Friction drive greasy	Clean turntable (64) and friction wheel (22)
Trouble:	Possible cause:	Remedy:
	Friction wheel (22) exerts insufficient pressure	Adjustment 15
	Friction wheel (22) eccentric	Replace
Rumbling noise when programme (27) frame is rotated	Friction in contact pins (30 and 31)	Adjustment 19
Strong hum in sound	Bass adjustment incorrect	On amplifier (140) set one step higher (138)
	Attachments during transit not released	Release
	Shielding of tone-arm cable (26) has earthshort to mechanism	Bend away, insulate if necessary.

	Additional loud-speaker takes too much power	Replace by smaller one
	Very long lead from remote volume control (134) run near electric fields	Use screened cable. earth amplifier (139) screening
	Record playing motor (23) does not run parallel with turntable	Adjustment 16
No sound reproduction	Sapphire loose	Fit new one
	Sapphire contacts dirty	Clean and replace sapphire if necessary
	Tone-arm cable (26) disconnected.	Re-solder
	Screw-connection (117) on t-a. cable (25) loose on amplifier	Screw up tight
	Soldered connections of t-a. cable (26) shorted	Bend apart
	Loud-speaker (141) terminals on amplifier (140) loose	Tighten up
	Short-circuit at remote control (134) or lead	Check and repair
	N4 (3) permanently closed	Adjustment 12
	Fuse (142) in amplifier blown	Replace
	Defective valve	Replace

Trouble during record changing:

Tone-arm (92) switches off too soon	Tone-arm switching-off contact (17) displaced	Adjustment 32
Tone-arm (92) does not switch off	Tone-arm switching-off contact (17) displaced	Adjustment 32
	Tone-arm switching-off contact (17) dirty	Clean
Tone-arm (92) switches off but record does not go back but is played again	Cancelling magnet (80) fails to cancel selector pin	Adjustment 23
	Cancelling magnet (80) fails to operate	Check N5 and N6 (3) Adjustment 12
Tone-arm (92) does not lift off	(Control-rail (14) jammed	Free; grease guide slightly if necessary
	Return spring (13) of control-rail (14) damaged or broken	Replace

Trouble:	Possible cause:	Remedy:
Tone-arm (92) switches off, record-changer motor (42) is running but lifters (62) do not move or only do so slowly and jerkily	Compression spring of drive clutch (57) damaged or broken	Replace
Tone-arm (92) switches off but record does not go back and is played again	Cancelling magnet (66) coil defective	Replace
	Selector pin (98) jammed.	Loosen and grease slightly if necessary

	MSK (82) has permanent earth connection	Insulate stop (82) and check leads
Record remains on centring cone (65) and then perhaps falls into wrong compartment	Heavy burr in centre hole of record	Remove burr
Sapphire is not cleaned by brush (48)	Brush (48) wrongly adjusted	Adjustments 35 to 38
	Pressure plate (11) in contact with control-cam (12) pin	Check pressure-plate (11) tension spring (10) adjust pressure plate (11)
	Torsion spring (9) on brush-arm (59) broken or detached	Hook in or replace
	Brush (48) loose and twisted	Adjust and secure
Noises in loud-speaker while records are being changed	N4 (3) does not close	Adjustment 12
Record-changing motor (42) does not switch off after lifter (62) has risen; magazine (78) does not start	Contact-cams 2 (4) displaced	Adjustment 12

General operational troubles:

When there is trouble in any of the operating phases, we advise making a check, based on the description of the method of operation, as to whether the necessary switching and control units are actually switched on and ready. We advise making the check in the following sequence:

1) Check the faulty part and its mechanical control for jamming and damage.

2) Check whether all the relays pull on and drop out as explained in the section "Method of operation".

3) Check with the circuit diagram whether the current paths are correctly closed or open.

a) Check whether the working contacts of the relays and switches are closed correctly and that their rest-contacts are sufficiently open.

b) Check whether the rest-contacts of the relays and switches not switched in close correctly and that their working contacts are sufficiently opened.

c) Check that the switch, relay and sliding contacts concerned are not dirty and burnt and, more particularly, whether the sliding contacts have enough applied pressure.

d) Check that the appropriate leads, soldered joints and terminal connections are not disconnected or loose.

e) Check that the insulation of the leads and switch units are not damaged and that there are no short-circuits due to bent parts of contacts.

4) Check all settings in the operating phases involved for accurate adjustment.

1	Dial with figures
2	Pointer
3	Cam-switch
4	Switching cam
5	Threaded pin
6	Cam-switch roller
7	Outer adjusting collar
8	Inner adjusting collar
9	Torsion spring
10	Pressure-plate tension spring
11	Pressure-plate
12	Control disc
13	Control-disc tension spring
14	Control-rail
15	Pressure pin

16 Lifter spindle
17 Tone-arm short-circuiting contact TK
18 Counter-weight
19 Balancing lever
20 Tension spring for friction drive
21 Rocker shaft
22 Friction wheel
23 Record-playing motor
24 Sliding contact for MSK
25 Sliding contact for cancelling magnet
26 Tone-arm cable
27 Programme frame
28 Contact wiper
29 Adjusting collar for contact pin
30 Outer contact pin
31 Inner contact pin
32 Wiper contact for selector magnet B
33 Wiper contact for selector magnet A
34 Switching strip
35 Contact spring
36 Contact-plate
37 Outer row of contacts
38 Inner row of contacts
39 Magazine back stop brake
40 Inner adjusting collar for rocking shaft
41 Outer adjusting collar for rocking shaft
42 Record-changing motor
43 Capacitor for record-changing motor
44 Eye of return-motion brake
45 Tension spring for return-motion brake
46 Felt brake

FIGURE Wiping contacts from instrument No.21,110 onwards

47 Limiter pin
48 Sapphire brush
49 Brush-arm
50 Upper mechanism suspension

51	Knurled nut
52	Record-changing drive
53	Camshaft
54	Tension-chain
55	Chain-guide
56	Adjuster-chain
57	Drive clutch
58	Lifter rodding
59	lifter adjusting screw
60	Lifter lever
61	Rear head-plate
62	Lifter
63	Lifter tension spring
64	Turntable
65	Centring cone
66	Centring magnet
67	Securing screw for control stirrup
68	control stirrup
69	Rocker
70	Record bows
71	Playing counter (pop,meter)
72	Counting wheel
73	Actuating pin
74	Tipper
75	Eccentric for tipper
76	Securing screw for core
77	Record guide
78	Record magazine
79	Clamping screw
80	Cancelling magnet
81	Selector pin OOA
82	Magazine stop
83	Cancelling-magnet push-rod
84	Adjusting screw for push-rod
85	Sheet metal cover
86	core

87	Stop-pin
88	Tone-arm mounting
89	Tone-arm support screw
90	Adjusting screw for tone-arm lift
91	Tone-arm tension spring
92	Tone-arm
93	Front head-plate
94	Selector push-rod B
95	Selector magnet B
96	Selector plate segment
97	Drum segment
98	Selector pin
99	Securing screw for drum
100	Selector magnet A
101	Clamping screw
102	Selector push-rod A
103	Tension spring for magazine motor
104	magazine motor
105	multi-wire cable for mechanism
106	Pair of contact rivets 60
107	Contact-bridge
108	Series resistor
109	Lower support for mechanism
110	B plug
111	Slider resistor
112	C plug
113	Relay for credit and title indication
114	Multi-wire cable for title indication
115	A plug
116	Wander plug (6 V connection)
117	Tone-arm cable connector
118	Locking pin
119	Locking screw
120	Locking screw for contact-plate
121	Spring hook
122	Threaded rod

123	Clamp for drum covering
124	Cancelling push-button
125	Mains switch
126	Connection for additional loud-speaker
127	F plug
128	E plug
129	Control instrument
130	Rotatable selector
131	Securing device during transit
132	Medium frequency loud-speaker
133	Bass loud-speaker
134	Remote loud-speaker control
135	Support-pin
136	Upper board
137	Treble adjustment
138	Bass adjustment
139	Plug for remote control
140	Amplifier
141	Loud-speaker connection terminals
142	amplifier fuse
143	Power pack
144	Fuse for D.C. section
145	Mains cable
146	Plug for control instrument
147	Socket for power pack
148	Coin-switch MK 100
149	Coin-switch MK 10/20
150	Coin-switch MK 50
151	Terminals for coin-switch
152	Chokes for fluorescent tube
153	Push-buttons A/B
154	Indicator lamp for long-playing records
155	Lamp for push-buttons
156	Plastic Front
157	Fluorescent tube
158	Starter for fluorescent tube